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Academic Motivation Scale for Learning Biology: A Scale Development Study

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Abstract

This study aimed to develop "Academic Motivation Scale for Learning Biology (AMSLB)" for high school students. The sample of the study consisted of randomly selected 472 students studying at the 9th, 10th, 11th and 12th grades of a science high school and five Anatolian high schools located in the central district of Kars. The scale development process included three steps: (1) exploratory factor analysis, (2) replication of the exploratory factor analysis with a different sample, and (3) confirmatory factor analysis. According to the analyses results, the scale was composed of 19 items and 4 sub-scales. These sub-scales were named as Intrinsic Motivation, Amotivation, Extrinsic Motivation - Career and Extrinsic Motivation - Social. The internal consistency of the scale was computed by using Cronbach Alpha and it was revealed that the results derived from this dataset had high reliability.

Keywords

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Introduction

Ryan and Deci (2000) defined motivation as acting to do something. They described those who do not have a motive or inspiration to take an action as amotivated, while they considered those who want to participate vigorously or actively as motivated. Since individuals have different reasons and aims to act, they have different types of motivation (Ryan & Deci, 2000). The basic view in this respect is the classification of Deci and Ryan (1985, 1991). Based on the self-determination theory arguing that psychological needs such as competence, autonomy and relatedness should be taken into account to understand human motivation (Deci & Ryan, 1980; 1985), Deci and Ryan (1985, 1991) categorized motivation types as intrinsic motivation, extrinsic motivation and amotivation. According to this classification, intrinsic motivation represents individuals' doing something because of the fact that they intrinsically like and enjoy it, whereas extrinsic motivation represents individuals doing something for the outcomes.

Deci and Ryan (2000) argued that since intrinsic motivation led to better learning and creativity, it is important for educators. They also stated that, unlike intrinsic motivation, extrinsic motivation was commonly considered as an inadequate form of motivation. For example, students may participate in a task that their teachers assign to be seen as successful or to get praise rather than they are interested in it or they like it. Therefore, being aware of the forms of extrinsic motivation, teachers can turn this situation into a successful strategy for effective teaching (Deci & Ryan, 2000).

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On the other hand, amotivation is generally observed when individuals get negative feedback, in repeated failure, or they feel that they are not self-sufficient to reach the desired goals (Deci & Ryan, 1985).

In the literature, the term academic motivation is used for students' motivation towards academic activities, and scales have been developed to identify their motivation styles. Using the motivation types based on the self-determination theory principles by Deci and Ryan (1985, 1991), Vallerand et al. (1992) developed the Academic Motivation Scale. This scale was structured on the question "why?" and the scale items were consisted of the possible answers for the question "Why do you go to school?" (Vallerand et al., 1992).

As for the studies on academic motivation, Gottfried (1986) developed the "Academic Intrinsic Motivation Scale" stating that intrinsic motivation was important for school competence and success. The scale has sub-dimensions in four different areas (i.e. reading, mathematics, social and science). In addition, Pelletier et al. (1995) developed the "Sports Motivation Scale". The scale was created within a "Why do you do sports?" structure and based on intrinsic motivation, extrinsic motivation and amotivation dimensions. Bozanoğlu (2004) also developed an "Academic Motivation Scale".

Examining the studies on biology, it can be seen that the scales are not subject specific and generally towards learning science (Glynn & Koballa, 2006; Tuan, Chin & Shieh, 2005). These scales were adapted into Turkish by some researchers using the concept "biology" instead of "science". For example, Students' Motivation toward Science Learning Questionnaire developed by Tuan, Chin and Shieh (2005) was adapted into Turkish by Yılmaz and Huyugüzel-Çavaş (2007) in similar form for science learning, and the same scale was adapted into Turkish as "Motivation towards Learning Biology Questionnaire" by Başer (2007) as well. This scale was developed after examining studies related to motivation and using the six motivational processes (i.e. self-efficacy, active learning strategies, science learning value, performance goals, achievement goal, learning environment stimulation).

In another study, "Science Motivation Questionnaire" developed by Glynn and Koballa (2006) was also adapted into Turkish as "Motivation for Biology Course Questionnaire" by Ekici (2009). The scale sub-dimensions were six motivational processes including intrinsically motivated biology learning, extrinsically motivated biology learning, personal relevance of learning biology, self-determination to learn biology, self-efficacy for learning biology and anxiety about biology assessment.

These major works of the literature were criticized for many reasons. For instance; Velayuthama, Aldridge and Fraser (2011) claimed that in the Students' Motivation toward Science Learning Questionnaire, developed by Tuan, Chien and Shien (2005), conceptualization and calculation of certain structures were complex and theoretically inconvenient. They also indicated that the scale had many negative items and this could cause confusion among high-school students. With regard to the Science Motivation Questionnaire developed by Glynn and Koballa; Velayuthama, Aldridge and Fraser (2011) focused on the second study done with this questionnaire (Glynn, Taasoobshirazi and Brickman, 2009) and indicated that there were only two items combined in one dimension and that the reliability coefficient of another dimension was low. Both scales were prepared for the university students. Thus, the present scale development study intends to contribute to the field.

As shown by the outlined studies from the literature, there has not been an academic motivation scale unique to learning biology. Furthermore, the case is that the scales towards learning science are mostly based on motivational processes (e.g. self-efficacy, goal orientation) instead of self-determination theory. In this sense, based on the self-determination theory, this study aimed to develop an "Academic Motivation Scale for Learning Biology (AMSLB)" for high school students. It is considered that this study would contribute to the literature by developing a scale unique to learning biology.

Method

Item Writing

While forming the scale items, the motivation model stated by Deci and Ryan (1985, 1991) in accordance with the self-determination theory was taken as the baseline. In this model, motivation is examined in three dimensions, which are intrinsic motivation, extrinsic motivation and amotivation. While creating the item pool, these three dimensions and the subsequent process were considered.

Motivation studies are towards the reason of a behavior. Therefore, the focus should be on "why" (Deci & Ryan, 1985). Considering this perspective, in the present scale development study, the construct of "why do you learn biology" was emphasized while forming the scale items, and the scale developed by Vallerand et al. (1992) was also used. The researchers reviewed the relevant literature, examined the motivation scales and created an item pool. Subsequently, two subject-matter experts selected the items to be put into the item pool. An item pool was generated which included 27 items - 12 items for intrinsic motivation, 9 items for extrinsic motivation and 6 items for amotivation. The experts, including a Turkish language expert, were again consulted. Accordingly, the items were organized in a scale form to administer a pre-test . The scale form was a 6-point Likert type ranging from "strongly disagree" (1) to "strongly agree" (6). To avoid a neutral middle point that refers to be indecisive, even numbers were not used in this likert scale. As Büyüköztürk, Çakmak, Akgün, Karadeniz and Demirel. (2014) suggested, the use of a neutral middle point leads most participants to mark the neutral choice.

Participants

To determine the research sample, the schools whose curriculum included biology courses were identified. Accordingly, this research was done at six high schools -one Science high school and five Anatolian high schools- in the center of Kars. Data were gathered from 191 students for study 1 and study 2. and from 281 students for study 3. Students were randomly selected from 9^{th}, 10^{th}, 11^{th}, and 12^{th} grades of those schools. All participants of this study took biology courses during their previous education and were also taking a biology course in their high schools. Of the participant students, 240 were male and 232 were female, and their median age was 17.2.

Data Analysis

This scale development study is mostly based on the hybrid approach explored in Matsunaga's study (2010). According to this approach, the scale development requires to do the principal components analysis (PCA) to reduce the number of items in the item pool in the first stage, to do the explanatory factor analysis with a different data set to determine the number of factors by using the items obtained from PCA in the second stage, and finally to do a confirmatory factor analysis with a new data set to support the factor structure obtained from the explanatory factor analysis. Although PCA was commonly used in the scale development studies as an explanatory factor analysis, many researchers claimed that PCA was not a factor analysis (See Costello and Osborne, 2005; Field, 2005; Matsugana, 2010). In this study, the second stage included a different sample in order to confirm the results of the first stage. To obtain consistent results from both stages, instead of PCA, the explanatory factor analysis was considered to be convenient.

Accordingly, in the present study, data from 191 students were initially gathered. The gathered dataset were divided into two and exploratory factor analysis was replicated in the both dataset to be able to form a strong factor structure. Then, to get evidence for the construct validity of the instrument, data were again gathered from 281 high school students. Consequently, the reliability and validity practices for the Academic Motivation Scale for Learning Biology (AMSLB) were conducted in three steps. Step 1 included the exploratory factor analysis while the exploratory factor analysis was replicated with a different sample in step 2, and in step 3, confirmatory factor analysis was performed.

Findings and Interpretation

Step 1: Exploratory Factor Analysis

Sampling

In the scale development process, firstly, 100 individuals were randomly selected from the first dataset gathered from 191 individuals, and exploratory factor analysis was conducted by using SPSS 19.

Findings:

Firstly, the factor analysis was conducted for 27 items using the Principal Axis Factoring method. The Principal Axis Factoring Method is the most common factor analysis method used in social sciences (Warner, 2012); so the Principal Axis Factoring Method is more appropriate for factor analysis than PCA (see Matsunaga, 2010; Warner, 2012). Statisticians (e.g.. Field, 2005; Thompson, 2004) emphasize that oblique rotation methods should be applied for dependent factors. In the light of the relevant literature it is thought that the expected factors are dependent; so this study uses the promax (kappa=4) which is an oblique rotation method.

Based on the initial findings, two items (i.e. "because being a successful student requires learning biology" and "I think that biology subjects are important") were excluded since they had close factor loadings (i.e. lower than .1) on two different factors (see Costello & Osborne, 2005). For example, as the factor loading of the item "because being a successful student requires learning biology" was .450 on a factor, it was .350 on the other factor. As for the third excluded item "I feel happy when I achieve in biology", it was decided to be excluded since it was not loaded on any of the factors and created a factor by itself. In addition, it was observed that 10 items were loaded in factor 1, and when these items were examined, four items having the lowest loadings were excluded since there were other items having similar meanings within the same factor. For example, because the item "I am interested in the field of biology" was semantically similar to the item "Biology subjects interest me", it was excluded from the scale considering its relatively low factor loading. Similarly, the item "I don't know. I think I waste my time when learning biology" in factor 2 was also excluded since the factor included a sufficient number of items that represented the related conceptual structure and this item had the lowest loading (.533).

As a result, the factor analysis was reconducted with the 19 items that were obtained. According to the repeated analysis results, the KMO value was found as .89, and it passed over the recommended cut off value of .60 (Field, 2005; Pallant, 2001). This value shows that the data structure was appropriate for factor analysis. Besides, examining the result of Bartlett's test, the chi-square value (χ^2 = 2028) was found to be statistically significant ($p<.001$). This result signifies that the correlation matrix was appropriate (i.e. it was not an identity matrix), and there was a sufficient level of relationship among the variables to conduct factor analysis (Field, 2005). Consequently, there were not any problems with evaluating the findings of the exploratory factor analysis.

According to the findings of the exploratory factor analysis, considering the Kaiser's eigenvalue rule of being higher than 1 and the consistent result of the scree plot, it was decided that the scale consisted of four factors. These factors explained 36.3%, 10.3%, 7.8% and 4.5% of the total variance, respectively. Based on the Promax method, the rotated four-factor structure explained 58.9% of the total variance. The first of the four factors were named as Intrinsic Motivation (IM), the second as Amotivation (A), the third as Extrinsic Motivation - Career (EM-C) and the forth as Extrinsic Motivation - Social (EM-S). Loadings on each of these four factors are presented in Table 1. To conclude; when the aforementioned items are excluded from the scale, 19 items are left and those items are distributed as: 6 for IM factor, 5 for A factor and 4 for each of EM-C and EM-S factors. As the factor loadings ranged from .540 to .890, factor correlations were between .113 (A and EM-S) and .668 (IM and A).

Table 1. Factor loadings of the four-factor AMSLB rotated by using Promax method

	Items	Factor			
		IM	A	EM-C	EM-S
10	I enjoy making discussion on biology subjects.	880 (.790)			
9	Learning new things on the biology subjects that I am interested in is enjoyable.	780 (.798)			
7	I enjoy sharing the new things that I learn in biology.	733 (.772)			
6	Biology subjects interest me.	697 (.839)			
1	I enjoy learning biology subjects.	673 (.790)			
17	I enjoy reading magazines and texts related to biology.	587 (.635)			
19	To be honest, I don't see any reason for learning biology.		890 (.892)		
14	Actually, I don't think the subjects that I learn will be useful for me in the future.		774 (.789)		
16	Honestly, I don't know why I should learn biology.		752 (.752)		
8	I have no idea. I don't understand how useful the things I learn will be.		736 (.796)		
12	In fact, I don't like participating the activities in biology.		707 (.728)		
11	Because it is related to the profession that I chose for my future.			856 (.849)	
15	Because it is important in my choice of profession.			777 (.783)	
2	To get a good job in the field of biology.			721 (.797)	
4	To be able to make better choices for university.			661 (.621)	
5	To show my family that I'm successful in biology.				717 (.677)
13	To prove myself that I can be successful in biology subjects.				664 (.707)
18	To show that I'm better than the other students.				662 (.696)
3	I want to be praised by the people around me.				540 (.551)

Note. Structure matrix coefficients are presented in parentheses. IM: Intrinsic Motivation, A: Amotivation, EM-C: Extrinsic Motivation - Career, EM-S: Extrinsic Motivation - Social.

Internal consistency was calculated for this four-factor structure and the Cronbach alpha values were .895 (6 items) for Intrinsic Motivation, .894 (5 items) for Amotivation, .843 (4 items) for Extrinsic Motivation - Career, and .745 (4 items) for Extrinsic Motivation - Social. Accordingly, it can be stated that the findings revealed from the dataset were considerably reliable.

Step 2: Repeating the Exploratory Factor Analysis in a Different Sample

Sampling

In this step of the study, the dataset belonging to 91 individuals remaining after randomly selected 100 individuals were excluded from the first dataset was used for repeating the exploratory factor analysis. Therefore, in this step, the exploratory factor analysis was replicated with the 19 items obtained from the analysis in step 1 while maintaining the number of factors as 4.

Findings:

As in step 1, in this analysis, Principle Axis Factoring factor exclusion method and promax (kappa = 4) rotation method was applied together. According to the analysis findings, the KMO value was found as .83 and Bartlett's test showed that the chi square value (χ^2 = 1006) was statistically significant ($p < .001$). For this reason, the findings of the exploratory factor analysis for the second part of the dataset were also suitable for evaluation.

With respect to the findings of the replicated exploratory factor analysis, the same four-factor structure revealed from in step 1 was also supported for the same 19 items. In this dataset, the variances explained by the four factors were 35.3%, 11.4%, 8.2% and 5.7%, respectively. In other words, the variance explained by each factor were quite close to those in step 1. The factor loadings of the items ranged from .436 to .972, which shows that each item explained sufficient proportion of variance (i.e. more than 10%) in its factor. On the other hand, similar to the findings in step 1, factor correlations ranged from .091 (EM-C and EM-S) to .654 (IM and A). Factor loadings of each item are presented in Table 2.

Table 2. Factor loadings of the four-factor AMSLB rotated by using Promax method according to the replicated exploratory factor analysis findings

	Items	Factor			
		IM	**A**	**EM-C**	**EM-S**
10	I enjoy making discussion on biology subjects.	972 (.858)			
9	Learning new things on the biology subjects that I am interested in is enjoyable.	832 (.811)			
6	Biology subjects interest me.	796 (.873)			
7	I enjoy sharing the new things that I learn in biology.	748 (.821)			
1	I enjoy learning biology subjects.	635 (.796)			
17	I enjoy reading magazines and texts related to biology.	589 (.603)			
19	To be honest, I don't see any reason for learning biology.		803 (.840)		
8	I have no idea. I don't understand how useful the things I learn will be.		791 (.854)		
16	Honestly, I don't know why I should learn biology.		769 (.716)		
14	Frankly, I don't think the subjects that I learn will be useful for me in the future.		746 (.769)		
12	Honestly, I don't like participating the activities in biology.		737 (.742)		
11	Because this is the profession that I chose for my future.			841 (.846)	
15	Because it is important in choice of profession.			789 (.793)	
4	To be able to make better choices for university.			735 (.687)	
2	To get a good job in the field of biology.			684 (.750)	
18	To show that I'm better than the other students.				750 (.756)
5	To show my family that I'm successful in biology.				712 (.664)
13	To prove myself that I can be successful in biology subjects.				631 (.720)
3	I want to be praised by the people around me.				436 (.418)

Note. Structure matrix coefficients are presented in parentheses. IM Intrinsic Motivation, A: Amotivation, EM-P: Extrinsic Motivation - Career, EM-S: Extrinsic Motivation - Social.

The internal consistency coefficients of the items were calculated by using Cronbach alpha, and this value was .908 for Intrinsic Motivation, .887 for Amotivation, .846 for Extrinsic Motivation - Career, and .715 for Extrinsic Motivation - Social. Therefore, it can be argued that the findings revealed from the second data set were also considerably reliable.

These findings clearly show that the results obtained in step 2 are in parallel with those in step 1, and supported the 19 items and the four-factor structure of AMSLB.

Step 3: Confirmatory Factor Analysis

After the factor structure obtained in step 1 was supported in step 2, and quite reliable findings were revealed, it was decided to conduct confirmatory factor analysis to provide evidence for the construct validity of the scale. Accordingly, the 19-item AMSLB was administered to a new sample.

Sampling

The dataset gathered in this step of the study was obtained from the different classes of the same schools that were used in the study 1 and study 2. 281 students studying at 9^{th}, 10^{th}, and 11^{th} grades participated in this study. 131 of these students were female and 149 were male, and there was 1 missing value in the gender variable.

Findings:

In this step, the dataset were firstly examined in terms of the assumptions. Since the ratio of the missing values was lower than 5%, it was thought that these values could be replaced by the mean values (Tabachnick & Fidel, 2007). The univariate and multivariate normality of the dataset and the outliers were checked. In this process, skewness and kurtosis values ranged between .099 and .927, and between .136 and 1.459, respectively, showing that the univariate normality of the data assumption was not violated. Then, the data belonging to 10 individuals tending to affect the multivariate normality were excluded from the dataset considering the mahalanobis distance values (as of this step, the sampling size decreased from 291 to 281). Using LISREL 8.80 (Jöreskog & Sörbom, 2006) with SIMPLIS command language, confirmatory factor analysis was conducted. The four-factor structure of the 19-item AMSLB was tested by employing maximum likelihood method. Examining the fit indices in the analysis findings, it was seen that the model fit the dataset ($\chi^2_{(146)} = 361.75$, $p < .05$; $\chi^2/sd = 2.48$; CFI = .96; GFI = .88; NFI = .93; RMSEA = .073; 90% CI = .063, .082). As is shown in Table 3, according to the standardized parameter (λ) estimates, the loading that each item has on its factor was higher than the .05 cut-off point recommended by Hair, Black, Babin, Anderson and Tatham (2010) and significant. Factor correlations (Phi values), as is shown in Table 4, ranged between .09 and .60. While all the factor correlations were significant at the level of $p < .01$, the relationship between Extrinsic Motivation - Social and Amotivation were not found as statistically significant. Besides, whereas the factors Intrinsic Motivation, Extrinsic Motivation - Social and Extrinsic Motivation - Career were positively related to each other, the factor Amotivation was found to be negatively related to the other three factors.

Table 3. Standardized Parameter Estimates (λ) for the Four-Factor AMSLB

	Items	Factor	λ
10	I enjoy making discussion on biology subjects.	IM	.68*
9	Learning new things on the biology subjects that I am interested in is enjoyable.	IM	.73*
6	Biology subjects interest me.	IM	.83*
7	I enjoy sharing the new things that I learn in biology.	IM	.75*
1	I enjoy learning biology subjects.	IM	.82*
17	I enjoy reading magazines and texts related to biology.	IM	.61*
19	To be honest, I don't see any reason for learning biology.	A	.70*
8	I have no idea. I don't understand how useful the things I learn will be.	A	.86*
16	Honestly, I don't know why I should learn biology.	A	.74*
14	Frankly, I don't think the subjects that I learn will be useful for me in the future.	A	.70*
12	Honestly, I don't like participating the activities in biology.	A	.61*
11	Because this is the profession that I chose for my future.	EM-C	.79*
15	Because it is important in choice of profession.	EM-C	.79*
4	To be able to make better choices for university.	EM-C	.69*
2	To get a good job in the field of biology.	EM-C	.77*
18	To show that I'm better than the other students.	EM-S	.71*
5	To show my family that I'm successful in biology.	EM-S	.69*
13	To prove myself that I can be successful in biology subjects.	EM-S	.59*
3	I want to be praised by the people around me.	EM-S	.58*

Note, IM Intrinsic Motivation, A: Amotivation, EM-C: Extrinsic Motivation - Career, EM-S: Extrinsic Motivation - Social., * p<.01

Table 4. Factor Correlations (Phi values)

Factor	2	3	4
1. IM	-.60*	.54*	.33*
2. A		-.35*	-.09
3. EM-C			.46*
4. EM-S			

Note. IM: Intrinsic Motivation, A: Amotivation, EM-C: Extrinsic Motivation -Career, EM-S: Extrinsic Motivation - Social.*p < .01.

After the four-factor structure of the scale was supported by the confirmatory factor analysis, internal consistency coefficients of the factors were calculated. The Cronbach alpha values were .875 for IM, .841 for A, .844 for EM-C and .736 for EM-S. Based on these values, it can be said that the obtained data for AMSLB were quite reliable. Mean, standard deviation and reliability coefficients for each factor are presented in Table 5.

Table 5. Mean, Standard Deviation and Reliability Coefficients (α) for the Sub-Dimensions of AMSLB

Factor	Mean	Standard Deviation	α
IM	4.13	1.25	.875
A	2.60	1.38	.841
EM - C	3.84	1.42	.844
EM - S	3.56	1.30	.736

Note. IM: Intrinsic Motivation, A: Amotivation, EM-P: Extrinsic Motivation – Career, EM-S: Extrinsic Motivation - Social

Results

Exploratory factor analysis was firstly conducted in this study aiming to develop a motivation scale unique to learning biology. The scale items were formed considering the basic dimensions of intrinsic motivation, extrinsic motivation and amotivation (Deci & Ryan, 1985; 1991). As a result of the factor analysis, it was found that the scale consisted of 19 items and four sub-dimensions. In other words, the extrinsic motivation items which were thought as only one dimension differed in terms of students' plans related to their career and social factors. Consequently, these items were grouped among themselves. Secondly, the exploratory factor analysis was repeated with a different sample and the factor structure of the scale was revealed as the same. The dimensions of the scale were identified as Intrinsic Motivation (IM), Amotivation (A), Extrinsic Motivation – Career (EM-C) and Extrinsic Motivation - Social (EM-S). Extrinsic motivation was divided into two factors as plans related to the career and social factors in all analyses. Deci and Ryan (1985; 1991) suggested three types of extrinsic motivation. These are regulating the behavior with extrinsic reasons, internalizing the extrinsic reasons and individuals perceiving the behavior as important to themselves. Within this perspective, in this scale, items related to regulating the behavior with extrinsic reasons were gathered under one factor, and named as Extrinsic Motivation - Social Factors (EM-S). Items related to internalizing the extrinsic reasons and individuals perceiving the behavior as important to themselves were gathered under one factor, and named as Extrinsic Motivation - Career (EM-C).

An analysis of the education system in Turkey indicates that students take a nationwide university entrance exam and they are placed in respective departments at universities regarding their exam scores. Than they receive a professional training in the department they are placed. Therefore, they prepare for this exam through their high school education and they choose certain fields (i.e. science, social sciences, Turkish – Mathematics) according to their interest. So, students choose these fields depending on their opinions and wishes about their future professional career. Herr and Cramer (1996) assert that students are expected to make choices in adolescence which will influence their career and the rest of their lives. Also they think that it is a significant development task to make professional decisions in adolescence (Sampson, Peterson, Lenz, Reardon & Saunders, 1996). In this respect, regarding that these students are getting through adolescence and they live in social conditions of Turkey, this scale development study evaluates that the division of career-related items of extrinsic motivation as a separate sub-dimension is a reasonable outcome. Moreover, in the validity research by Glynn, Taasoobshirazi and Brickman (2009) that was done for Science Motivation Questionnaire, the career-related scale items are collected in a separate sub-dimension. Finally, the factor structure of AMSLB was supported with confirmatory factor analysis, which provided evidence for construct validity. The Cronbach alpha values obtained for the reliability of the ssub-scales were .875 for intrinsic motivation, .841 for amotivation, .844 for extrinsic motivation-profession, and .736 for extrinsic motivation-social factors. All these processes that fallowed in the present study show that the scale had good content and construct validity to measure high school students' academic motivation for learning biology and provide reliable results for the obtained data.

Academic motivation has positive effects on students' performance and learning (Singh, Granville & Dika, 2002; Wentzel & Wigfield, 1998; Fortier, Vallerand & Guay, 1993). From this perspective, measuring and evaluating students' academic motivation would provide insights on what should be done to increase their learning performance. It is thought that students having academic motivation toward biology that is one of the science courses would be beneficial in terms of training individuals who would join the science world of the future and taking successful steps. Consequently, this scale development study is of significance for filling the gap in the literature.

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